

AMENDMENTS TO THE SPECIFICATION

Please replace the last paragraph bridging pages 6 and 7 with the following rewritten paragraph:

[0010]

FIRST EMBODIMENT

FIGS. 1 to 10 illustrate a first embodiment of the present invention, in which FIG. 1 is a fragmentary cross-sectional view showing the configuration of a rotating electric machine with a built-in control device, FIG. 2 is a cross-sectional view showing the detailed configuration of the control device of FIG. 1, FIG. 3 is a plan view of a heat sink and a surrounding area to a heat sink, FIG. 4 is a plan view of the heat sink, FIG. 5 is a plan view showing a positional relation of switching devices and smoothing capacitors, FIG. 6 is a detailed configuration diagram of conductive studs, FIG. 7 is an enlarged view of a fixing part where the heat sink of the control device is attached to a rear bracket, FIG. 8 is an explanatory view for explaining work for fixing the conductive studs to the heat sink, FIG. 9 is an explanatory view showing flows of heat and cooling air through the rear bracket, and FIG. 10 is a perspective view showing a conductive stud assembly according to a variation of the present embodiment.

Please replace the last paragraph bridging pages 8 and 9 with the following rewritten paragraph:

[0013]

A rotation sensor 28 for detecting the number of revolutions of the main shaft 1 is mounted on the outside of the rear bracket 6. The control device 400 for controlling currents

supplied to the stator coils 3b is mounted on the outside of the rear bracket 6 in the axial direction thereof. The detailed configuration of the control device 400 is now described in the following. Shown in FIG. 3 is a state of the switching devices 12 attached to the heat sink 13 as viewed schematically from the left side of FIG. 2. As depicted in FIG. 4, the heat sink 13 includes a fanlike plate portion 13a made by cutting part of a disk, the plate portion 13a having radiating fins 13b integrally formed in a radial pattern by an aluminum die-casting method. There are formed through holes 13d in the heat sink 13~~The heat sink 13 has through hole forming parts 13d which form through holes.~~ Returning to FIGS. 2 and 3, the heat sink 13 is combined with a resin member 17, together forming a dishlike base 60 shaped like a shallow circular petri dish as a whole.

Please replace the second full paragraph on pages 9 with the following rewritten paragraph:

[0014]

As shown in FIG. 3, three switching devices 12 for controlling AC power supplied to the stator coils 3b are attached to the heat sink 13 with spacings in a circumferential direction in such a manner that heat is sufficiently conducted to the heat sink 13 and the switching devices 12 are electrically insulated therefrom. The heat sink 13 and the resin member 17 of the dishlike base 60 are cut out as shown in FIGS. 2 and 3 to form a window 51~~In the dishlike base 60, there is formed a window forming part 51 by the heat sink 13 and the resin member 17 for forming a window~~ through which the end portion 9a of the brush holder 9 is inserted.

Please replace the second full paragraph on page 10 with the following rewritten paragraph:

[0016]

A control circuit board 16 is disposed to the left of the smoothing capacitors 14 as illustrated in FIG. 2, or on the outside of the smoothing capacitors 14 in the axial direction of the main shaft 144 (sic). Electronic components, such as an IC and a transistor, are mounted on the control circuit board 16. Signal terminals 122 (FIG. 2) through which the switching devices 12 are driven or sensing outputs are taken out from inside the devices are provided on the control circuit board 16.

Please replace the last paragraph bridging page 10 and 11 with the following rewritten paragraph:

[0017]

The conductive studs 300 which are composite conductors each include a double-end stud 301 made of a copper alloy with externally threaded parts 301a, 301b formed on both end portions, a resin shield 302 disposed on an outer periphery of the double-end stud 301 to provide insulation, and a cylindrical metal sleeve 304 of which outer periphery is externally threaded, the metal sleeve 304 being integrally fixed to the outside of the resin shield 302 as illustrated in FIG. 6. Further, a spacer member 305 having a specific length is disposed on the outside of each metal sleeve 304 in such a manner that externally threaded parts 304a, 304b are exposed at both ends of each metal sleeve 304, the spacer member 305 being formed of a material having a good thermal insulating property. The externally threaded part 301a at one end of each double-end

stud 301 is inserted into the heat sink 13 through one of the through hole forming parts~~holes~~ 13d formed therein and the three conductive studs 300 are fixed by tightening metallic nuts 308 onto the externally threaded parts 304a of the individual metal sleeves 304 as illustrated in FIG. 8.

Please replace the first full paragraph on page 12 with the following rewritten paragraph:

[0019]

The accommodating case 70 assembled in the aforementioned manner is fixed as illustrated in FIGS. 1 and 2 by inserting the externally threaded parts 304b~~304a~~ of the metal sleeves 304 of the three conductive studs 300 into respective through holes formed in the rear bracket 6 and tightening metallic nuts 308 onto the externally threaded parts 304b~~304a~~ of the individual metal sleeves 304. At this time, there is formed a particular spacing between the heat sink 13 and the rear bracket 6 by the spacer members 305 provided on the conductive studs 300.

Please replace the last paragraph bridging pages 13 and 14 with the following rewritten paragraph:

[0022]

However, since the heat sink 13 is fixed to the rear bracket 6 with the spacer members 305 placed in between, there is formed the particular spacing between the heat sink 13 and the rear bracket 6 so that conducted heat and radiant heat are interrupted and the radiating fins are cooled by the cooling air as mentioned above. It is therefore possible to suppress temperature increase of the control device. Also, since the capacitor board 15 is disposed on the outside of the switching devices 12 in the axial direction of the main shaft 1 and the control circuit board 16

is disposed further on the outside in the axial direction, it is possible to reduce an area necessary for these components 12, 15, 16~~a necessary area~~. Additionally, the control circuit board 16 which is most susceptible to heat is mounted at an outermost position (leftmost position as illustrated in FIG. 2) in the axial direction so that the influence of heat from the rear bracket 6 can be reduced. Furthermore, since the brush holder 9 holding the brushes which act as a noise source is accommodated in the brush holder retaining part 6c of the rear bracket 6, the brush holder retaining part 6c made of an aluminum alloy suppresses noise to the control circuit board 16, for instance, thereby improving reliability of the control device.

Please replace the last paragraph bridging pages 17 and 18 with the following rewritten paragraph:

[0028]

In particular, in the case of electronic components having a heat spreader on a rear side of a package, a structure which dissipates heat generated by the electronic components through the control circuit board 16 is preferable. Here, a heat radiating path in the control device 420 is explained by using FIG. 12(b)13 (sic) which is a partially enlarged view of FIG. 12(a)12 (sic). An electronic component 26 having a heat spreader is soldered onto a conductor pattern A on one side of the control circuit board 16, the conductor pattern A having~~metal pattern (hereinafter referred to as the metal pattern A) which has~~ approximately the same area as the heat spreader. The conductor pattern~~metal pattern~~ A is connected to a conductor pattern B~~metal pattern (hereinafter referred to as the metal pattern B)~~ on the other side of the control circuit board 16 by way of via holes 27 formed in a substrate of the control circuit board 16~~an inner wall~~. A resin

sheet 25 is placed between the ~~conductor pattern~~metal pattern B and the cover 19 in such a manner that the resin sheet 25 is tight contact with both the ~~conductor pattern~~metal pattern B and the cover 19. Compared to a substrate material of the control circuit board 16, copper patterns forming the via holes have higher thermal conductivity and provide good heat conduction from the heat spreader of the heat-generating component, so that the heat generated by the electronic component on a rear side of the control circuit board 16 can be effectively radiated.

Please replace the last paragraph bridging pages 18 and 19 with the following rewritten paragraph:

[0029]

Further, a control device 430 can produce yet enhanced heat radiation performance by providing fins 171 on the outside of the cover 19 which is held in contact with the control circuit board 16 via resin sheets 25 as shown in FIG. 13. Whether the fins 171 need to be installed, as well as fin height and the area of a base portion of the fins 171~~floor area~~, may be determined in consideration of a temperature increase of an electronic component due to heat generation thereof and a balance between a temperature increase of the control circuit board 16 and a permissible temperature thereof. As shown in FIG. 2, the outside of the cover 19 is located at a position most separated from heat-generating parts of the main body of the rotating electric machine, such as the stator 3 and the rotor 200, and the fan 7 attached to the rotor 200 cools the radiating fins 13b~~13a (sic)~~ and draws in airflow into the interior of the main body of the rotating electric machine by way of the through holes 6b in the rear bracket 6. Consequently, the airflow heated by the main body of the rotating electric machine does not come into contact with an

outside part of the cover 19. Therefore, the airflow at the lowest temperature come into contact with the outside part of the cover 19 at all times. This is advantageous for cooling the control circuit board 16 which is particularly sensitive to heat.

Please replace the last paragraph bridging pages 20 and 21 with the following rewritten paragraph:

[0030]

Also, as the control circuit board which is relatively sensitive to heat is disposed at an outermost location most separated from the main body of the rotating electric machine which is a heat-generating part, and the heat radiating path and the fins for dissipating heat generated by the control board are disposed at a location most separated from the main body of the rotating electric machine, it is possible to cool the control circuit board most efficiently without the influence of the heat generated by the main body of the rotating electric machine.

While the foregoing discussion of the individual embodiments has illustrated examples in which cooling air is drawn into the main body of the rotating electric machine by the fan 7, the embodiments of the invention produce the same effects when applied to~~the embodiments produce the same effects in~~ a rotating electric machine of a totally enclosed fan-cooled type or other type as well. The embodiments also produce the same effects even when the rotating electric machine is a generator, a generator-motor, a starter, a power-assisted generator-motor or of other types.

Please replace the last paragraph bridging pages 24 and 25 with the following rewritten paragraph:

[0036]

Furthermore, the rotating electric machine with the built-in control device is characterized in that the conductors are rodlike conductors, and each of the composite conductors includes an insulating shield member covering an outer periphery of the conductor, a cylindrical thread member mounted on an outer peripheral side of the insulating shield member, the thread member having an externally threaded part, and an annular member~~a ring-shaped annular member~~ having a specific length along an axial direction of the conductor, the annular member being disposed in such a manner that the externally threaded part on an outer periphery of the thread member remains disposed on both sides along the axial direction of the conductor, wherein one end portion of the externally threaded part left disposed is passed through the heat sink and a nut is screwed onto the one end portion of the externally threaded part to fasten the heat sink between the nut and the annular member while the other end portion of the externally threaded part left disposed is passed through the bracket on the side opposite the load side and another nut is screwed onto the other end portion of the externally threaded part to fasten the bracket on the side opposite the load side, whereby the heat sink is fixed to the bracket on the side opposite the load side in such a manner that the annular member is positioned as the spacer between the heat sink and the bracket on the side opposite the load side. It is therefore possible to reduce the number of components.

Please replace the last paragraph bridging pages 26 and 27 with the following rewritten paragraph:

[0039]

FIG. 1 is a fragmentary cross-sectional view showing the configuration of a rotating electric machine with a built-in control device according to a first embodiment of the present invention;

FIG. 2 is a cross-sectional view showing the detailed configuration of the control device;

FIG. 3 is a plan view of a heat sink and a surrounding area to the heat sink;

FIG. 4 is a plan view of the heat sink;

FIG. 5 is a plan view showing a positional relation of switching devices and smoothing capacitors;

FIG. 6 is a detailed configuration diagram of conductive studs;

FIG. 7 is an enlarged view of a fixing part where the heat sink of the control device is attached to a rear bracket;

FIG. 8 is an explanatory view for explaining work for fixing the conductive studs to the heat sink;

FIG. 9 is an explanatory view showing flows of heat and cooling air through the rear bracket;

FIG. 10 is a perspective view showing a conductive stud assembly according to a variation of the first embodiment;

FIG. 11 is a cross-sectional view showing the configuration of a control device according to a second embodiment of the present invention;

FIG. 12 is a diagram showing the configuration of a variation of the control device of FIG. 11, FIG. 12(a) being a cross-sectional view of the control device and FIG. 12(b) being an

enlarged view of a part A of FIG. 12(a); and

FIG. 13 is a cross-sectional view showing the configuration of another variation of the control device of FIG. 11.